

Sheep grazing during drought collapses the perennial grass resource in Australian semi-arid wooded grasslands

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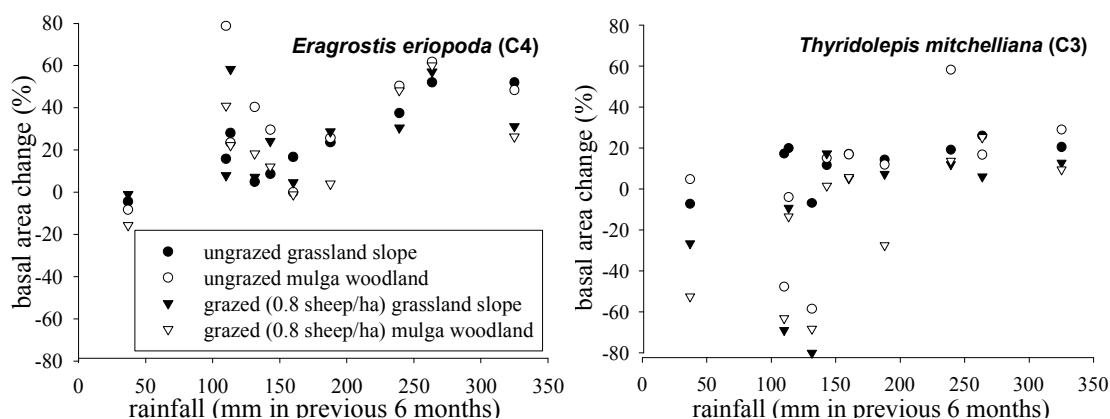
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Introduction Grazing of sheep in arid grasslands is risky; sudden shifts to lower functional states may occur when the ecosystem is stressed (Scheffer *et al.*, 2001). To avoid the stresses that shift states, easy-to-recognise critical thresholds need to be identified (Westoby *et al.*, 1989). Preliminary analysis of perennial grass survival in a drought indicated a critical threshold based on co-occurrence of drought and grazing. Crossing this threshold collapses grass populations (Hodgkinson, 1994). Here we examine the relationships between basal area change and rainfall and grazing levels based on a 10-year period and propose a management guideline.

Materials and methods From 1986 to 1996, 6 Merino wethers continuously grazed each of 7 paddocks, each 4-15 ha. The landscapes within each paddock were similar and typical of banded mulga (*Acacia aneura*) woodland. Exclosures (3 x 3m) in each zone (Tongway & Ludwig, 1990) in each paddock were controls. In each zone of each paddock 15 m square quadrats were located randomly. At intervals of 6 months, grass basal area was estimated by adding the basal areas of individual grass plants.

Results Basal area expanded when rainfall was >100 mm for *E. eriopoda* and >150 mm for *T. mitchelliana*. Species (C3 versus C4) determined expansion more than rainfall amount, grazing level or zone location. Below these rainfall thresholds, the less palatable *E. eriopoda* contracted only a little but plants of the highly palatable *T. mitchelliana* were nearly eliminated when grazed during the prolonged drought from early 1991-1995. Contraction of *T. mitchelliana* during this drought was generally greater in the woodland than upslope grassland zone for both the heavily grazed and ungrazed treatments.



Conclusions When sheep graze heavily in this banded woodland, drought contracts the basal area of some palatable grasses, largely by plant death but shrinkage may be due also to death of some tillers. These plant death times are termed death traps because the mass deaths are set by grazing and sprung by drought. It should be possible to minimise the deaths by reducing sheep density to very low or zero levels as drought conditions begin (3 month rainfall < 75 mm). Such grazing management is termed "Tactical Grazing" because the decision to reduce numbers is made on the basis of an approaching drought.

References

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